

CRATAEGUS SERIES BRACTEATAE AND TRIFLORAE (ROSACEAE)

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ABSTRACT

Crataegus series *Bracteatae* and *Triflorae*, both of the southeastern United States, are revised and shown to possess significant similarities. In each series, one of the two species recognized is moderately common, the other possibly extinct in the wild, raising conservation concerns. A key to series is provided and full descriptions for both series. Each series has a key to species, detailed species descriptions, and county level distribution maps for each species, these being the first such known to be produced. In addition, each species except *C. harbisonii* (ser. *Bracteatae*), which has an excellent illustration in Lance and Phipps (2000), is provided a with new line illustration. All species are typified and representative specimens are cited for each.

KEY WORDS: *Crataegus*, ser. *Bracteatae*, ser. *Triflorae*, taxonomic revision, typification, illustrations, maps, keys, specimen citation

RESUMEN

Crataegus series *Bracteatae* y *Triflorae*, ambas del sudeste de los Estados Unidos, se revisaron y mostraron tener similitudes significativas. En cada serie, una de las dos especies reconocidas es relativamente común, la otra posiblemente extinta en la naturaleza y presentando problemas de conservación. Se ofrece una clave para las series y una descripción completa de ambas. Cada una de las series tiene una clave de especies, descripciones detalladas de las especies, y mapas de distribución a nivel de condado de todas las especies, siendo la primera vez que se produce esto. Además, se aporta una ilustración todas las especies excepto *C. harbisonii* (ser. *Bracteatae*), que tiene una ilustración excelente en Lance y Phipps (2000). Se tipifican todas las especies y se citan especimenes representativos de cada una de ellas.

This paper constitutes another contribution to the continuing series by the first author aimed at revising much of *Crataegus* for the southeastern United States. Other numbers have dealt with ser. *Aestivales* (Phipps 1988), series *Apiifoliae*, *Cordatae*, *Microcarpae* and *Brachyacanthae* (Phipps 1998), *Parvifoliae* (Phipps & Dvorsky 2006) and *Pulcherrimae* (Phipps et al. 2006).

This paper is primarily a revision of the species in ser. *Bracteatae* and *Triflorae* but the series are brought together for convenience and because they do share certain diagnostic characteristics. Appropriate molecular analysis will answer questions about serial relationships. An abbreviated key to series that occur in the southeastern United States (see taxonomic part) illustrates their diagnostic characteristics and separates the two series from the others in that region. It is possible that the two series should be fused but it is not the intention of this paper to develop that issue. Interestingly though, L. Echols, RL and JBP have recently encountered a population in Houston Co., Georgia that appears to share characteristics between *C. triflora* and *C. ashei* although on the small sample available judgement is withheld.

Series *Triflorae* and *Bracteatae* are both marked by a high degree of glandularity, considerable pubescence, unlobed to only very shallowly lobed leaves, few-flowered inflorescences, calyx lobe margins dissected and large flowers (20–30 mm diameter). *Crataegus triflora* has an unusually high stamen number relative to other members of the genus. Inflorescences borne on the new season's growth arising direct from woody extension shoots may occur in all species except *C. ashei* and are another attribute of both series. A separate discussion of this last point follows below. Elsewhere, this feature has only been recorded in *Mespilus canescens* among closely related taxa. All species are bushes or occasionally small trees that are found in open woodland and woodland margin often on black-soil prairies. Each series has two species, one moderately common, the other very rare or extinct.

Crataegus generally bears its reproductive organs terminally on woody short shoots. Although internode length varies somewhat in these sort shoots, it is shorter to much shorter than on extension shoots. Moreover, such short shoots are perennial, borne lateral to extension shoots, are woody and do not themselves branch.

The approach used in this paper is essentially the same as that used in others of the set. Loans were requested from nearly 40 southeastern herbaria plus three of national scope: HUH, MO and US, but material of the two series turned up in only 22 loans. The loan material was supplemented by extensive collecting over a number of years mainly by JBP and RL. Four phenetic species were recognized, each of which proved possible to key out to species named in Beadle (1903) and were typified as appropriate. Detailed series and species descriptions were drawn up, as were keys to both series and species. Line illustrations for three of the species, county distribution maps and citation of representative specimens for all species were then prepared. This will be the first time that any of these species has been mapped in detail and we believe that this also is the case for two of the species illustrated.

Species concepts are morphological and based on a cluster of diagnostic characters for each taxon and unambiguous separation between each. In this respect it is worth noticing that, unusually for *Crataegus*, none of the taxa treated here have synonyms. This itself gives a measure of support to our species limits. No explicit data on breeding system was available for any species but recently Talent and Dickinson (2005) have produced an array of ploidy level data for taxa treated here, mainly derived from Lance collections. This did not help in arriving at our specific limits but has potential implications for a better understanding of the two series and relevant discussion is provided under the species treatments.

TAXONOMY

This part of the paper commences with a key designed to discriminate series *Bracteatae* and *Triflorae* from other sympatric series. It is followed by a conventional treatment of the two series and their constituent species with some discussion of each. The abbreviation LII refers to the leaf incision index or degree to which sinuses extend toward the midvein. Thus, an LII of 0% represents no lobing, 100% cut to the midvein.

ABBREVIATED KEY TO SERIES OF *CRATAEGUS* IN THE SOUTHEASTERN UNITED STATES

1. Short-shoot leaves lobed with veins to larger sinuses _____ ser. **Apiifoliae***, **Cordatae***, **Microcarpae***
1. Short-shoot leaves lobed or not, never any veins to sinuses.
 2. Fruit black; short-shoot leaves lacking lobes; thorns < 1cm long, recurved _____ ser. **Brevispinae***

2. Fruit red to yellow; short-shoot leaves lobed or not; thorns mostly 2–5 cm long (except some ser. *Lacrimatae* with very short thorns), straight to slightly recurved (sect. **Coccineae, sens. lat.**).
3. Ultimate twigs normally not zigzag at any node.
 4. Short-short leaves usually $< 1.6 \times$ as long as wide; usually with 2–4 clearly defined lobes per side.
 5. All green plant parts highly glandular; flowers 20–30 mm wide; inflorescences few-flowered; stamens 10 or 30–45 _____ **ser. Triflorae**
 5. Only some green plant parts glandular; flowers 12–20 mm wide; inflorescences mainly 5–15-flowered; stamens ca. 10 or ca. 20 _____ **sect. Coccineae, sens. str. (ser. Molles, Coccineae, Tenuifoliae, Silvicolae, Pruinosae, Intricatae, Pulcherrimae*, C. flava)**
 4. Short-short leaves mostly $1.75\text{--}2 \times$ as long as wide; usually quite unlobed, though sometimes with 1–2 very small notches per side or alternatively with somewhat undulate sides.
 6. Green plant parts mainly \pm eglandular _____ **ser. Aestivales*, Crus-galli, Punctatae**
 6. Green plant parts highly glandular.
 7. Leaves glossy, \pm coriaceous at maturity, usually very short-petiolate, 1–4 cm long.
 8. Fruit yellow to ruddy; calyx lobes as long as petals; flowers small (12–15 mm. wide); leaves 1–2 cm long _____ **ser. Parvifoliae***
 8. Fruit red; calyx lobes much shorter than petals; flowers larger (15–20 mm. wide); leaves 2–4 cm long _____ **ser. Bracteatae**
 7. Leaves \pm matte, usually thin or at least not markedly coriaceous at maturity, long-petiolate; generally 3–6 cm wide and 3–8 cm long at maturity _____ **C. triflora (ser. Triflorae, p.p.)**
3. Ultimate twigs always evidently zigzag at nodes _____ **ser. Lacrimatae, sens. lat.**

* treated in other papers in this series

DIRECT COMPARISON OF SERIES BRACTEATAE AND TRIFLORAE

1. Flowers (15–)20–25 mm wide; stamens ca. 20 or 22–25; leaves \pm coriaceous at maturity; bushes with main stem dominance _____ **ser. I. Bracteatae**
1. Flowers 25–30 mm wide; stamens 10 or 30–45; leaves generally thin; multi-stemmed bushes _____ **ser. II. Triflorae**

series **Bracteatae** Sarg. ex Rehder, Man. cult. trees, 1940:363. TYPE SPECIES: *C. harbisonii* Beadle.

Group without rank *Bracteatae* Sarg., Silva Suppl. 13:34. 1902.

Medium-sized shrubs; thorns 2–4 cm long, somewhat stout, dark and \pm shiny at 2 yrs. old. Leaves deciduous, fairly short-petiolate, less than 1/4 length of leaf blade, pubescent, glandular-stipitate; blades 2–7 cm long, broad-elliptic to obovate or roughly suborbiculate in general shape; usually unlobed, except sometimes with 2–4 lobed apiculi; margins regularly and strongly toothed, the teeth glandular and near the base usually stipitate-glandular; venation craspedodromous with 5–7 pairs of lateral veins; \pm appressed-pubescent above young, persisting or \pm glabrescent, below hairy mainly on the veins; texture coriaceous. Inflorescences 3–12 flowered, sometimes on leafy short shoots of the season; branches densely tomentose, bearing semi-persistent, large, ligulate, gland-bordered, or smaller, caducous, membranous, bracteoles. Flowers 20–25 mm wide; hypanthium externally tomentose; calyx lobes glandular-pectinate; stamens 20–25, anthers usually ivory; styles 3–5. Fruits 1–few per infructescence, ca. 10–14 mm broad, hairy, red to ruddy; calyx lobes long, conspicuous, patent-reflexed; nutlets 3–5, dorsally furrowed, laterally smooth.

Habitat and Distribution.—This series comprises one fairly common species, *Crataegus ashei*, and one very rare species, *C. harbisonii*, together occurring from Louisiana to Alabama in the piedmont and north into Tennessee and the Virginia Blue Ridge.

They are found in brushy places including prairie margins and open woodland. Unequivocal ploidy levels obtained are all tetraploid.

Comment.—The *Bracteatae* are characterized by relatively few-flowered and fairly large-flowered inflorescences and possess very glandular petioles, leaf margins, pedicels and calyx lobe margins, which parts are also usually very hairy. They share these characteristics with the remarkable series *Triflorae* to which they appear to be related. Number of flowers per inflorescence is not a good discriminator among the species mentioned. *Crataegus harbisonii* may bear its inflorescences on side-shoots of the season. The leaves of ser. *Bracteatae* have longer petioles than the superficially similar ser. *Crus-galli*.

KEY TO SPECIES

1. Leaf blades never, or scarcely perceptibly, lobed (LII 0–5%); marginal teeth 1.5 mm long; 2-yr. old thorns fine; all inflorescences borne on perennial spur-shoots; bracteoles less persistent, sometimes membranous _____ **1. *C. ashei***
1. Some larger leaf blades evidently, if shallowly, lobed (max. LII ca. 10–15%); marginal teeth 2 mm long; 2-yr. old thorns quite stout; inflorescences quite often on leafy side-shoots of the season; bracteoles particularly persistent, often subherbaceous _____ **2. *C. harbisonii***

Crataegus ashei Beadle, Biltmore Bot. Stud. 1:339. 1900. (**Figs. 1, 2**). TYPE: U.S.A. ALABAMA. Montgomery Co.: Montgomery, between the fairgrounds and the river; May 14 1900, C.D. Beadle 2275 (LECTOTYPE here designated: US 963476; ISOLECTOTYPES: exist but n.v.).

Bushes to 5 m tall; thorns few to numerous, 2–3 cm long at 2 yr. old, shiny, very dark brown to black, somewhat slender, ± straight; extending twigs densely pubescent, at 1 yr old tan to chestnut, somewhat shiny; older gray. Leaves deciduous; petioles 0.75–1.5 cm long, densely pubescent, bearing stipitate glands; blades 3–6 cm long, elliptic; acute to subacute at the apex, base cuneate into the winged upper part of the petiole; generally no sign of lobing; margins with even, triangular, acute teeth about 1.5 mm long, the teeth gland-tipped, those at the base of the blade glands stipitate; venation craspedodromous 5–7 lateral veins per side; persistently scabrous-hairy above, below thinly pubescent to glabrous on the surface, veins hairy; upper surface shiny mid-green. Inflorescences 3–10 flowered, not on leafy short shoots of the season; branches densely villous, bearing linear, herbaceous to membranous, gland-margined bracteoles. Flowers (15–)20–23 mm wide; hypanthium externally tomentose; calyx lobes narrow-triangular, 6–7 mm long, abaxially pilose, margins glandular-pectinate; petals ± circular, white; stamens 20(–25), anthers cream(pink); styles 3(–5) with bristly hairs at the base. Fruit 10–14 mm wide, subglobose, dense short-pubescent, orange-red to deep red; calyx lobes long, patent-incurved; nutlets 3(–5), dorsally grooved, sides smooth.

Common name.—Ashe's hawthorn.

Habitat and Distribution.—This is a plant of brushy places and open woodland understorey occurring from Louisiana to Alabama and is apparently fairly scarce. Recently (2000) JBP has come across a highly disjunct record for the Virginia Blue Ridge.

Comment.—*Crataegus ashei* has quite often been confused with both *C. triflora* and *C. harbisonii*. It differs substantially from *C. triflora* in its different growth habit, smaller flowers, 20–24 stamens, and unlobed, generally more coriaceous and shiny leaves. It is, however, much more similar to *C. harbisonii*, mainly differing in being smaller in its vegetative parts, lacking reproductive side-shoots of the season and by having quite entire leaves—see the key. *Crataegus ashei* often has a growth habit not unlike generally sympatric *C. berberifolia*, with ± layered branching and smallish leaves. The seven specimens cited in Talent and Dickinson (2005) are all tetraploid.

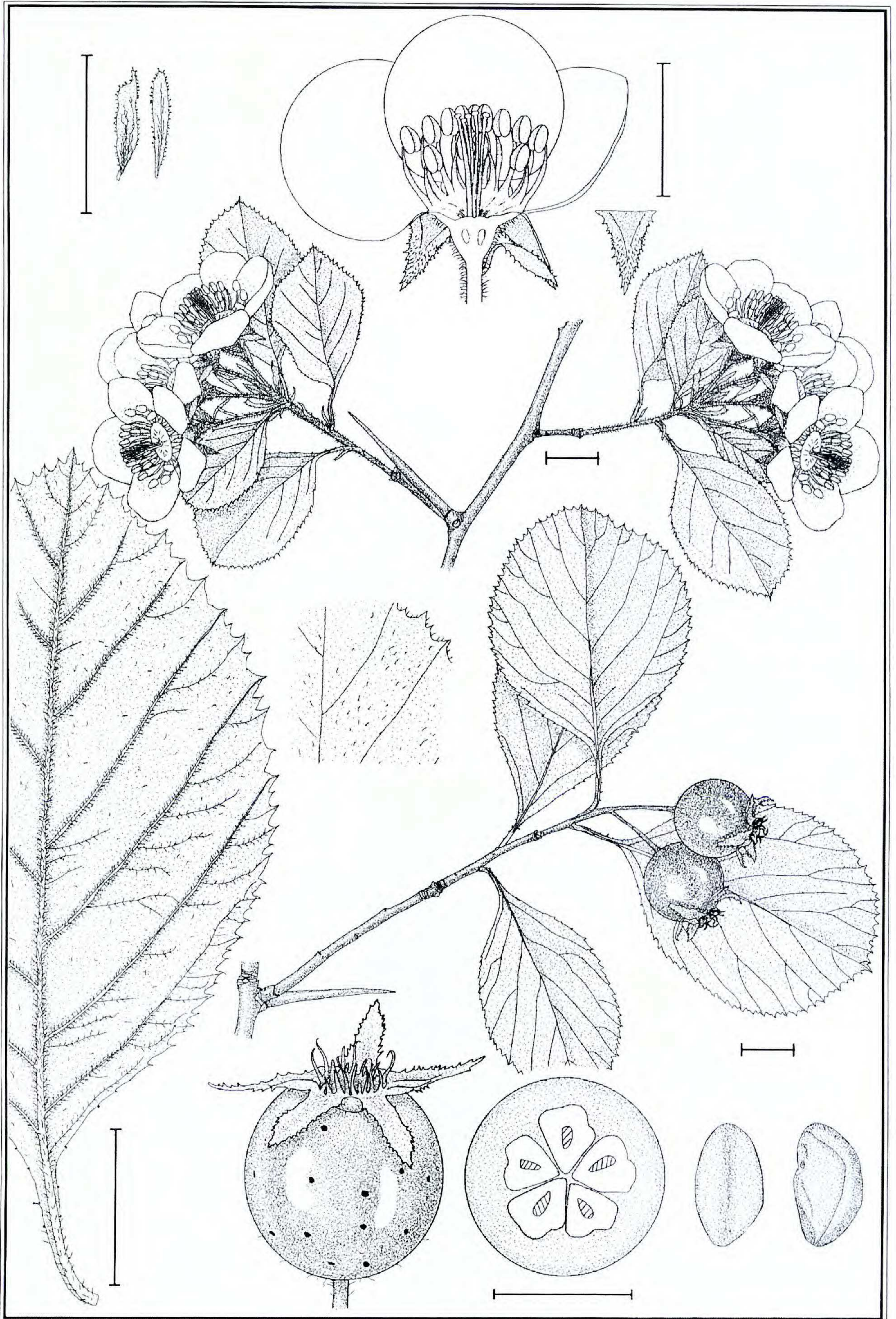


FIG. 1. Line illustration of *C. ashei*. Scale bars = 1cm; S. Laurie-Bourque del.

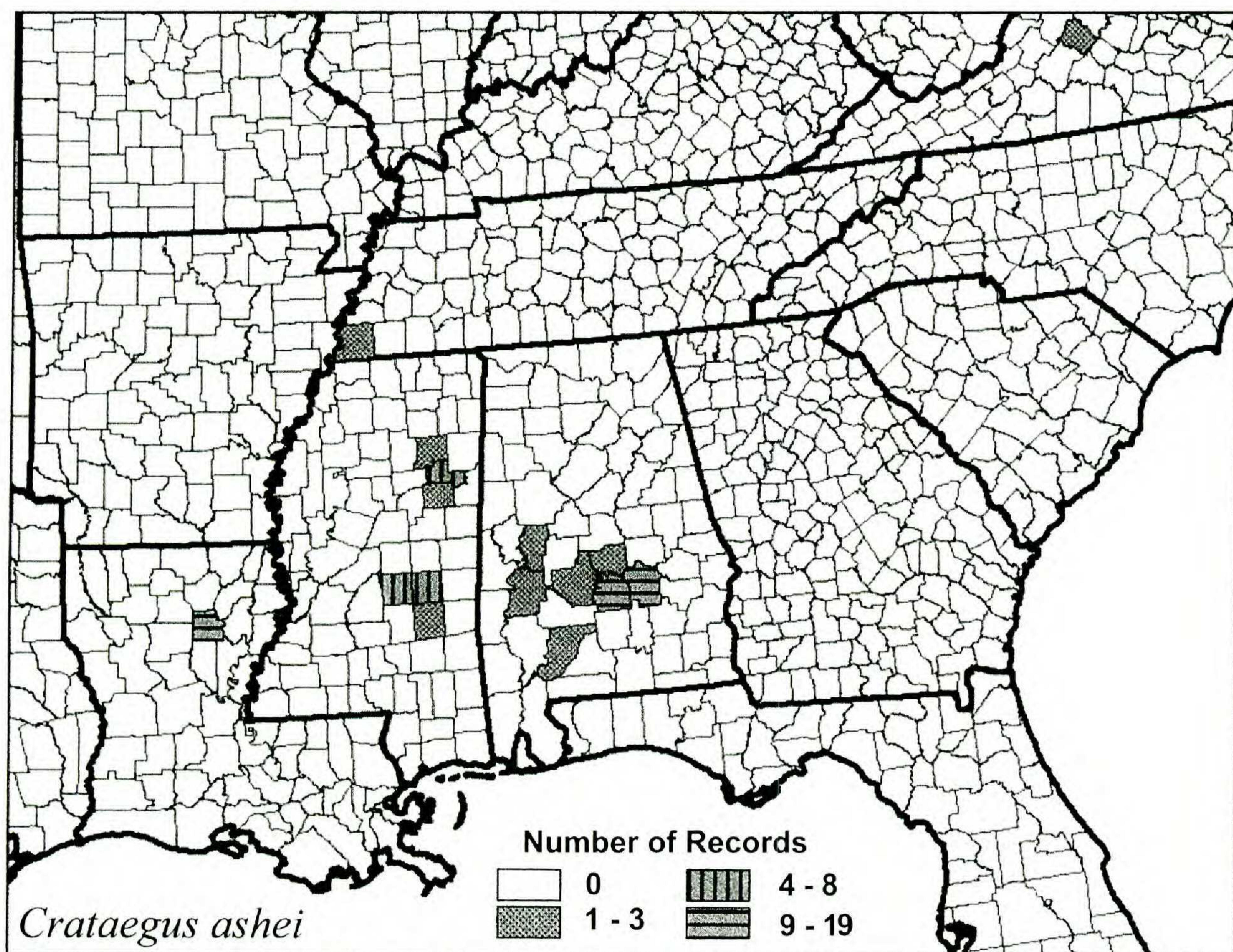


FIG. 2. County level distribution map of *C. ashei*.

2. *Crataegus harbisonii* Beadle, Bot. Gaz. 28:413. 1899. (Fig. 3). TYPE: U.S.A. TENNESSEE. Davidson Co.: W Nashville, hilltop in limestone soil, May 29 1899, T.G. Harbison 181 (LECTOTYPE here designated: US 969473). Specimens of T.G. Harbison 181 (= same tree) exist collected at other times.

Bushes or trees to 8 m tall; extending shoots sparsely pilose; 1 year old shoots becoming smooth, chestnut-brown; thorns 3–4 cm long, stout, \pm straight, glossy dark brown or near black. Leaves deciduous; petioles 1/2–1 cm long, thinly pilose, gland-dotted, winged above; blades 4–7 cm long, broadly elliptic to ovate in general shape; tip acute, base cuneate; entire or with up to 4 very shallow lobes per side; margins strongly (ca. 5 teeth per cm) double-serrate with outward pointing teeth, these gland-tipped early; venation craspedodromous with 6–7 pairs of lateral veins; rather shiny and coriaceous at maturity, appressed-pubescent above when young, when mature pubescent on the veins below. Inflorescences 5–12 flowered, frequently on leafy short shoots of the season; branches pilose, bearing 7–18 mm long, 2–4 mm broad, semi-persistent, subherbaceous, glandular-pectinate to glandular-serrate bracteoles; anthesis early May in Nashville, Tennessee. Flowers 20–25 mm wide; hypanthium pubescent externally; calyx lobes lanceolate, glandular-laciniate; petals \pm circular, white; stamens 20, anther color cream to light yellow; styles 3–5. Fruit mostly 12–22 mm wide in recently observed living material, \pm globose, pubescent, orange-red to red; calyx lobes semi-persistent, patent-reflexed; nutlets 3–5, dorsally furrowed, sides \pm plane.

Iconography.—Lance and Phipps (2000).

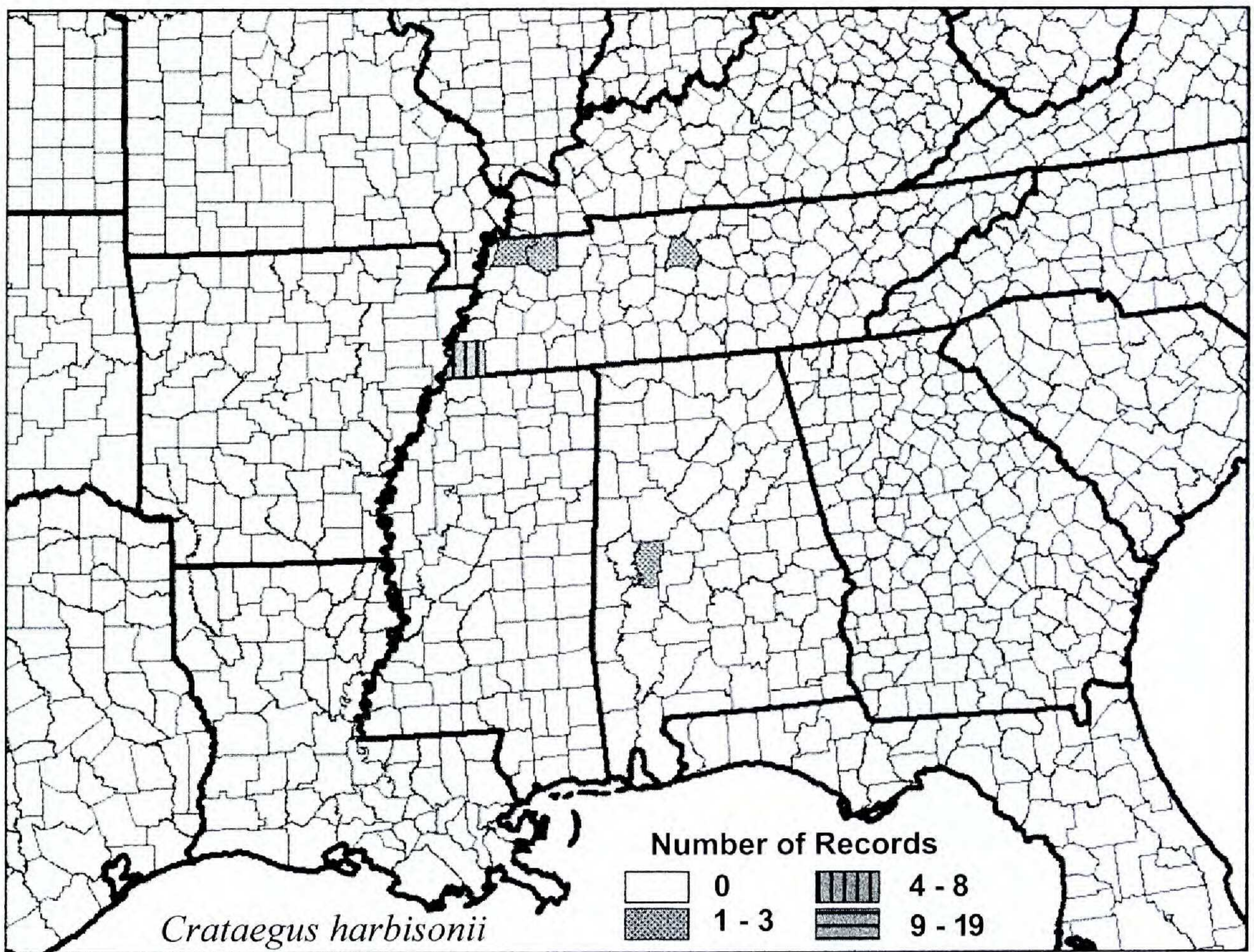


FIG. 3. County level distribution map of *C. harbisonii*

Common name.—Harbison's hawthorn.

Habitat and Distribution.—This is a very rare, perhaps extinct species from wooded hills near Nashville, Tennessee and one locality in Alabama though its most reliable location is in cultivation in North Carolina and elsewhere due to strenuous efforts at propagation by the second author.

Comment.—Harbison's Hawthorn is very similar to *C. ashei* and could perhaps be thought of as a particularly robust form of that species. However, see discussion of the former species for differences, which we consider support specific rank. It has also similarities to *C. triflora* (ser. *Triflorae*) but is easily distinguished from that species by characteristics of growth-habit (see key), by its smaller flowers (except in the Louisiana and some Mississippi forms of *triflora*) with fewer stamens and by the much more coriaceous leaves with much larger and more distant teeth and among the most persistent bracteoles in the genus, a feature which led to the creation of series *Bracteatae*. All five specimens cited in Talent and Dickinson (2005), all originating from a tiny population in Nashville, Tennessee, are tetraploid.

II. ser. *Triflorae* (Beadle ex C.K. Schneid.) Rehder, *Man. cult. Trees*, 1940:364. TYPE SPECIES: *C. triflora* Chapm.

group without rank *Triflorae* Beadle in J.K. Small, *Fl. SE US*, 1903:533.

sect. *Triflorae* (Beadle) C.K. Schneid., *Ill. Handb. Laubholz*, 1:797. 1906.

Medium-sized shrubs; thorns 2–4 cm long, ± slender, dark gray or blackish at 2 yrs. old.

Leaves deciduous; petioles distinct, about 1/3 length of leaf blade, pubescent, glandular-stipitate; blades 3–8 cm long, elliptic to nearly suborbiculate in general shape; unlobed to shallowly 2–4-lobed per side (max. LII 10–15%); margins regularly and sharply toothed, the teeth glandular and near the base usually stipitate-glandular; venation craspedodromous with 5–7 pairs of lateral veins; \pm hairy above until maturity, hairy mainly on the veins below; texture usually thin. Inflorescences 2–6(–12) flowered, normally on leafy short shoots of the season; branches densely tomentose, intermixed with stipitate glands, bearing herbaceous, semi-persistent, large, ligulate, gland-bordered bracteoles. Flowers 25–30 mm wide; hypanthium externally tomentose; calyx lobes broad, triangular, deeply glandular-serrate, rather foliaceous; stamens ca. 10 or 30–45, anthers usually ivory; styles 3–5. Fruits 1–few per infructescence, ca. 10–15 mm broad, subglobose to obovoid, hairy, red to ruddy; calyx lobes long, conspicuous, patently-reflexed; nutlets 3–5, dorsally furrowed, laterally smooth.

Habitat and Distribution.—This series comprises one fairly common (*Crataegus triflora*) and one very rare (*C. austromontana*) species, occurring from Louisiana to Georgia in the piedmont and north into Tennessee with an outlier in Arkansas. They are found in brushy places including prairie margins and open woodland, as well as being able to tolerate considerable shade.

Comment.—The *Triflorae* constitute a distinctive series characterized by few-flowered and large-flowered inflorescences often borne on leafy short shoots of the season as well as very glandular petioles, leaf margins, pedicels and calyx lobe margins, which parts are also usually very hairy. The most similar series is ser. *Bracteatae*. The 30–45 stamens of *C. triflora* are unique in the genus. Also characteristic are the multiple stems lacking main trunk dominance and the inflorescences which are quite often being borne on lateral shoots of the season.

KEY TO SPECIES

1. Leaf blades nearly as broad as long, shallowly lobed; stamens 10 _____ **1. *C. austromontana***
 1. Leaf blades generally much longer than broad, seldom lobed; stamens 30–45 _____ **2. *C. triflora***

Crataegus austromontana Beadle, Bot. Gaz. 28:412. 1899. (**Figs. 4, 5**). TYPE: U.S.A. ALABAMA. De Kalb Co.: Valley Head, Sep 1899, C.D. Beadle 1288 (LECTOTYPE here designated: DOV).

Bushes, to 4 m tall; twigs of the season densely pubescent; 1 year old twigs brown; thorns not recorded. Leaves deciduous; petioles about 30% length of blades, densely pubescent, glandular; blades 4–7 cm long, broad-ovate to suborbicular in general outline; shallowly 3(–4)-lobed, largest LII ca. 15%; tip subacute, the base cuneate tapering into a upper petiolar wing; margins sharply toothed throughout, the teeth gland-tipped; venation craspedodromous, ca. 5 veins per side; when young appressed hairy above, especially on the veins, below thinly pubescent except on the veins, when older, surfaces generally glabrescent. Inflorescences ca. 3-flowered, on leafy short shoots of the season; branches dense-tomentose and bearing caducous, linear, membranous, gland-margined bracteoles; flowering 2 May 1911 at Valley Head, Alabama. Flowers ca. 25 mm wide; hypanthium externally densely tomentose; calyx lobes ca. 7 mm long, narrow triangular, herbaceous, margins glandular-pectinate, adaxially pubescent; petals broadly elliptic, white; stamens 10, anthers cream; styles 3–5. Fruit 12–15 mm wide, \pm globose, pubescent, red; calyx-lobes conspicuous; nutlets 3–5, dorsally grooved, sides plane.

Common name.—Valley Head hawthorn.

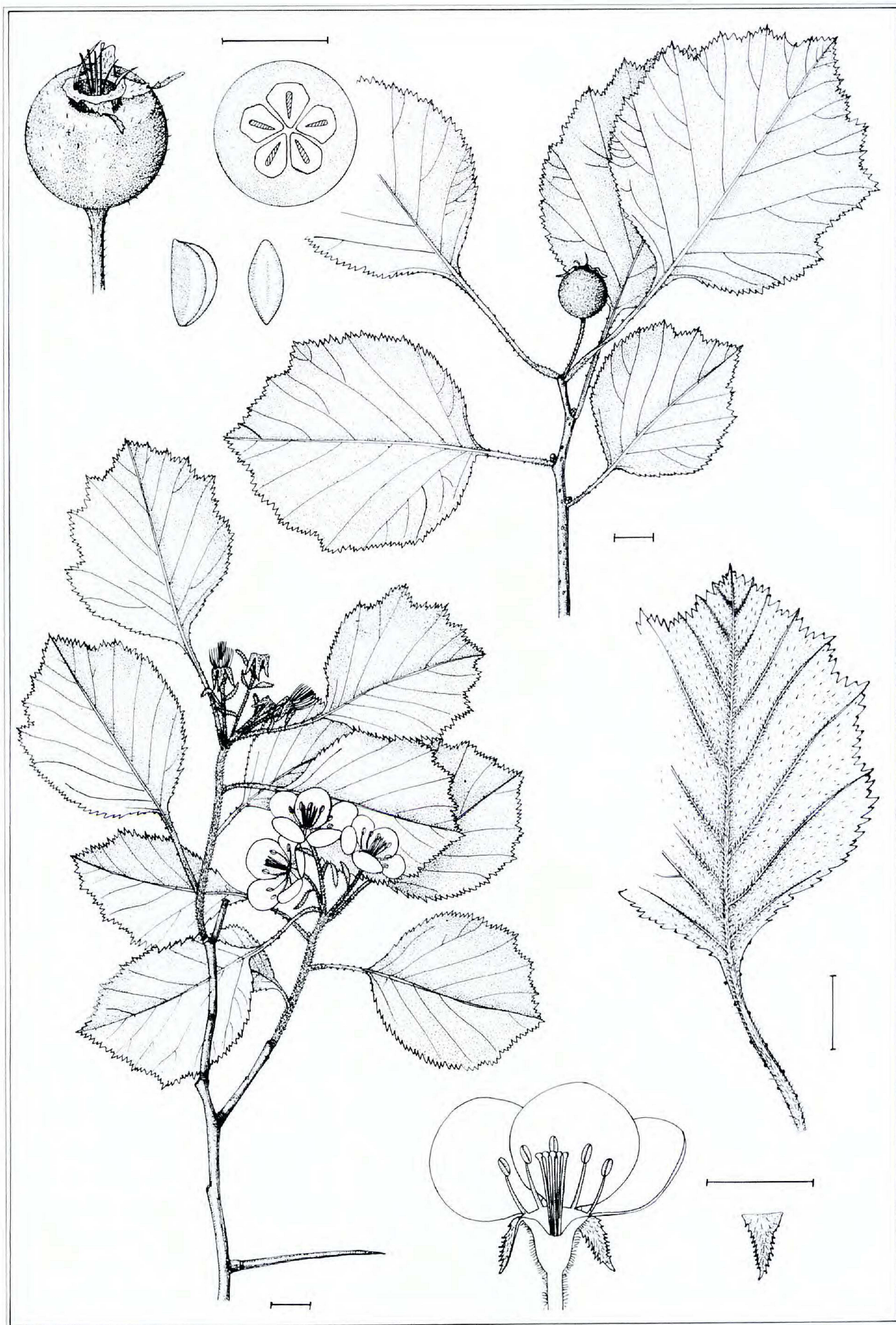


FIG. 4. Line illustration of *C. austromontana*. Scale bars = 1cm; S. Laurie-Bourque del.

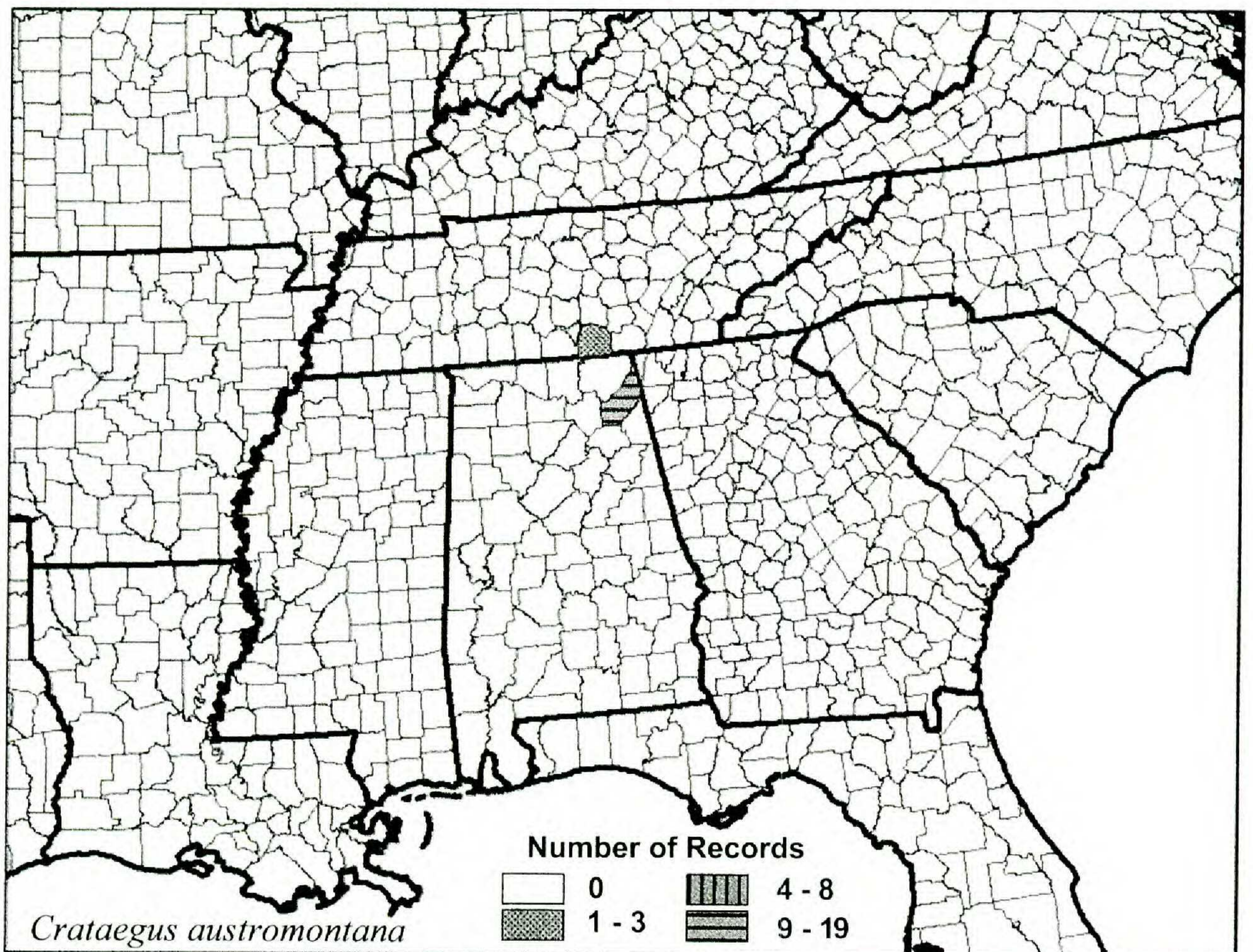


FIG. 5. County level distribution map of *C. austromontana*

Habitat and Distribution.—This is a very rare or possibly extinct species not collected since 1916. Beadle (1899) reported that it occurred throughout the Sand Mountain region of Alabama and had also been collected in the Cumberland Mountains and hill country of eastern and middle Tennessee.

Comment.—It is generally similar to *Crataegus triflora* but has broader, generally larger and more deeply lobed leaves and only 10 stamens.

2. *Crataegus triflora* Chapman, Fl. S US, 2nd Suppl. 1892:684. (Figs. 6, 7). TYPE: U.S.A. GEORGIA: 'Mountains of Georgia,' flowering specimen, 1883 or earlier, *Chapman Herbarium* 847 (NEOTYPE here designated: A). A quote from a letter on the type sheet suggests the last possible date for this collection.

Multistemmed shrubs to 4 or 5 m tall; twigs of current season appressed-pubescent, 2 year old twigs brown; older gray; thorns usually 2–4 cm long, ± slender, ± straight, dark gray or blackish; compound thorns on trunk. Leaves deciduous; petioles about 1/3 length of blades, dense pubescent, also stipitate-glandular; blades 3–8(–10) cm long, broadly elliptic in general shape; entire or shallowly and somewhat irregularly 1–3(–4)-lobed per side; tip acute; base cuneate, somewhat tapered into the petiole; margins finely serrate (ca. 10 teeth per cm), the teeth usually ca. 1 mm long, gland-tipped; venation craspedodromous with 5–7 veins per side; appressed-pubescent above and pubescent below when young, only veins below pubescent when old; texture thin. Inflorescences 2–6(–12) flowered branches dense-tomentose, bearing caducous, linear, thin, herbaceous, gland-bordered bracteoles; flowering late April–early May. Flowers 25–30 mm wide; hy-

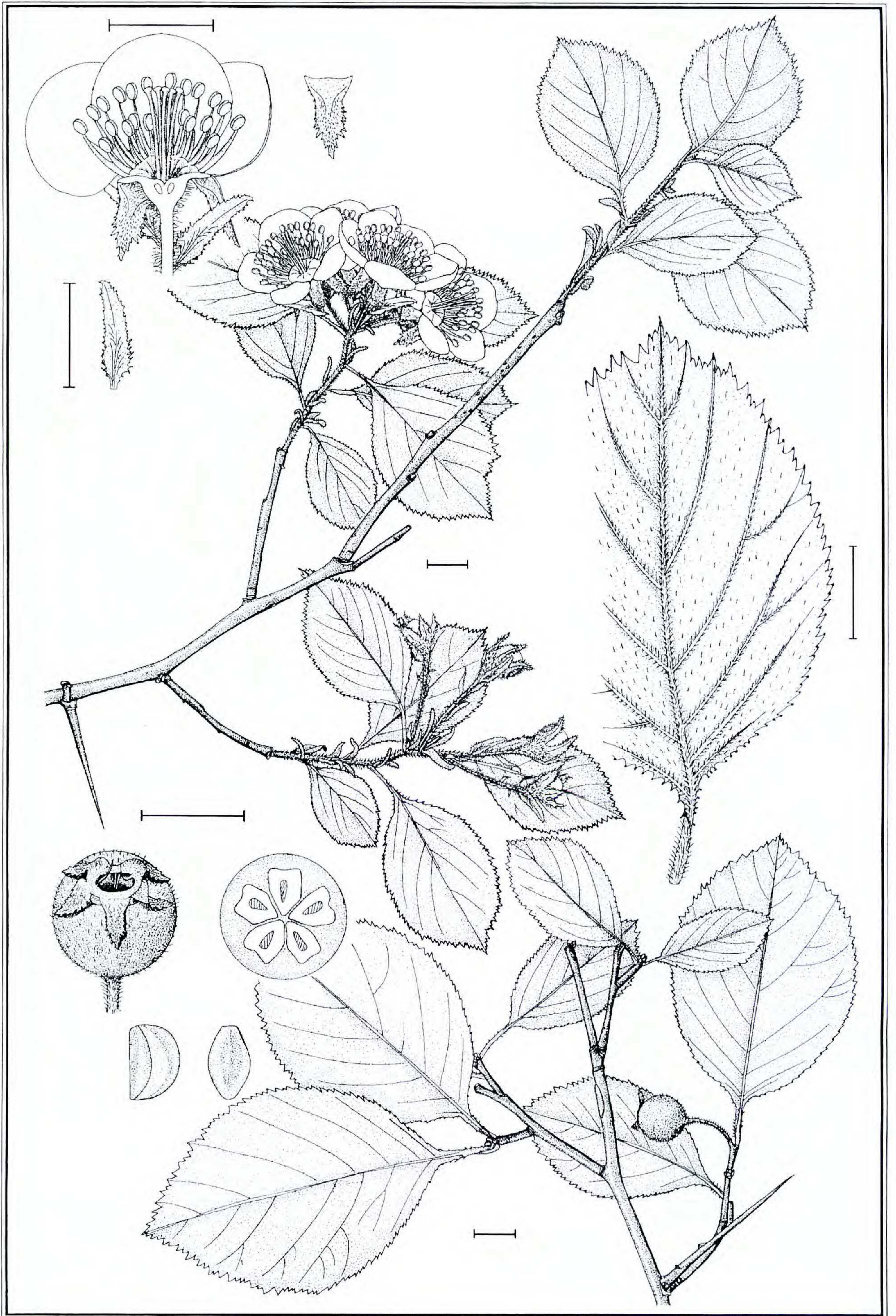


FIG. 6. Line illustration of *C. triflora*. Scale bars = 1cm; S. Laurie-Bourque del.

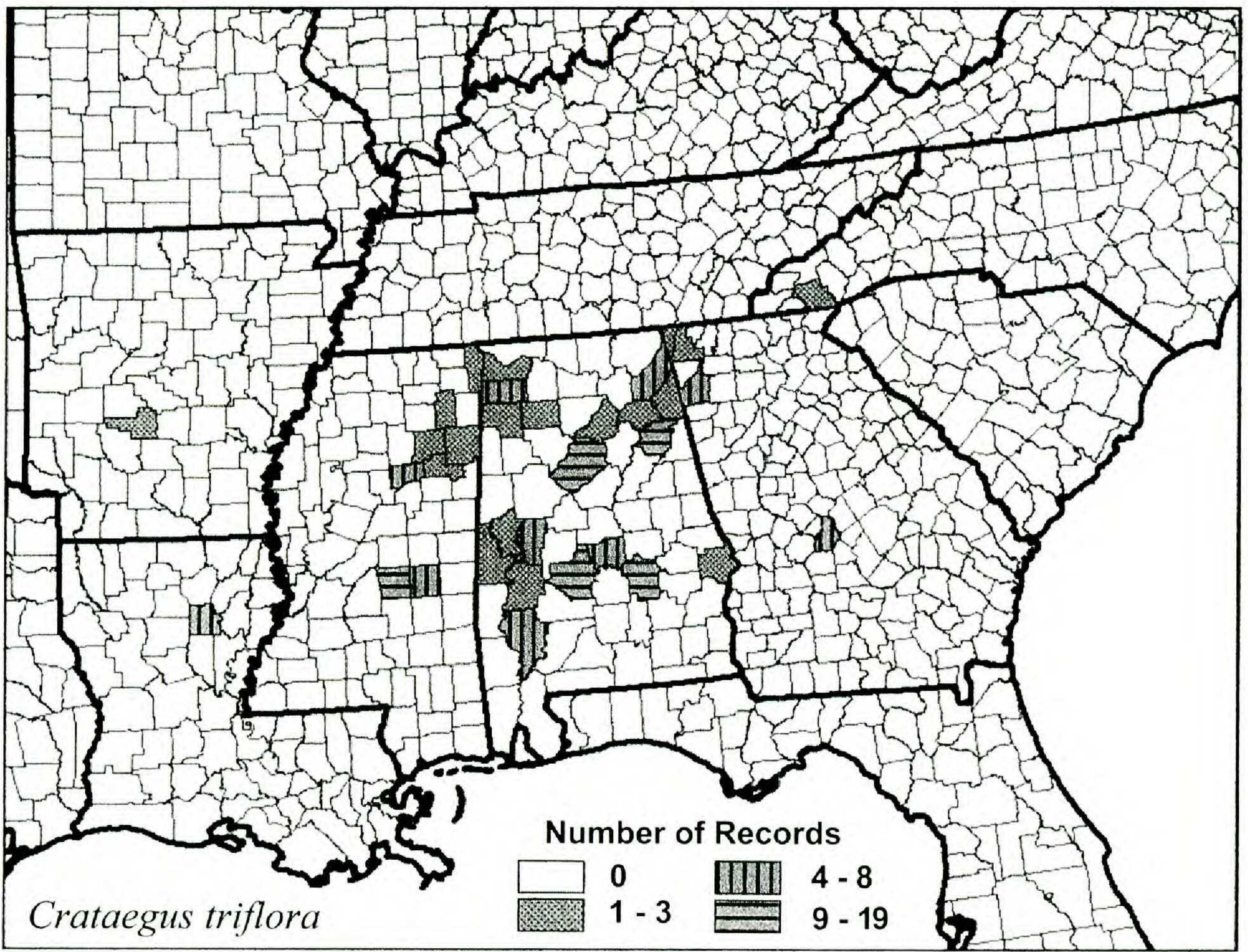


FIG. 7. County level distribution map of *C. triflora*

panthium externally densely tomentose; calyx lobes 8–10 mm long, herbaceous, glandular-pectinate, abaxially densely pubescent; petals \pm circular, white; stamens ca. 30–45 (47 in *Phipps & Herring 8130!*), anthers cream; styles ca. 4. Fruit ca. 12–15 mm high, subglobose to obovoid, pubescent, ruddy to deep or bright red, occasionally coral-red; reflexed calyx lobes long, persistent; nutlets dorsally grooved, sides smooth.

Iconography.—Color illustration: plate 64, Phipps et al. (2003).

Common name.—Three-flower hawthorn.

Habitat and Distribution.—This is a local plant known from six southeastern states which extends from Arkansas and Louisiana (rare in both) and Mississippi to Georgia, having also been found in Tennessee (also rare). It is only rarely locally abundant. It is found scattered in gaps in hardwoods, pine forest, cattle-grazed scrub on blackland soils, and sometimes prairie margins. Literature records from Virginia are probably *C. ×vailiae*.

Comment.—The protologue reads ‘cliffs of Coosa R., Rome’, suggesting that this should be the type locality but although this became a popular collection site for the species we have seen no material from there of appropriate date for lectotypification. Accordingly, we neotypify as above. *Crataegus triflora* is generally an open-grown, multi-stemmed, rather lax bush. Its flowers are among the most spectacular of all *Crataegus*, in size reminiscent of a wild rose. Although so dramatic and distinct a plant, it unaccountably disappeared from floras between Beadle (1903) and Phipps in Wofford (1989). A fairly rare form from central Mississippi has rather ovate leaves which may possess a nearly truncate base. This quite distinctive morph also possesses much larger marginal leaf teeth than

the typical form, more like *C. ashei*, but it has the flowers of *C. triflora*. Infrequent specimens with smallish, unlobed leaves may look very like *C. collina* if vegetative but are easily distinguished by their deeply glandular-serrate calyx lobes, and highly glandular leaf margins and petioles. Records from Tennessee generally have relatively broader leaves with unusually large marginal teeth. Variability in leaf-lobing is also a notable feature though so far it has been correlated with nothing else. The discovery of the large stamen number of *C. triflora* is first recorded in Phipps et al. (2003). The inflorescences may be much more floriferous than the name suggests. Another interesting feature of *C. triflora* is that it frequently produces inflorescences on fresh 2–5 cm long peduncles of the season that arise from woody extension shoots instead of at the tips of woody short shoots as is characteristic of most hawthorn species. Such a feature, rare in *Crataegus*, is universal in *Mespilus canescens*. Ploidy level determinations in Talent and Dickinson (2005) suggest that tetraploidy and triploidy are reasonably common but that diploidy is rare in *C. triflora*. The much smaller leaves and flowers of Caldwell parish, Louisiana populations as well as the diversity in leaf shape elsewhere, may possibly one day be shown to correlate with ploidy level variations but at present this is not detected.

APPENDIX

Consolidated database of cited specimens arranged alphabetically by species, state and county

Crataegus ashei Beadle (number of records: 52)

ALABAMA. Autauga Co.: prairie, Jones Bluff, N of Alabama River, S of Peace, 29 May 2000, *R. Lance* 2096, 2097, 2105 (UNC); same loc, May 1996, *J. Allison* 9114a, 9114b, 9116 (GA). **Dallas Co.:** Old Cahawba Archaeological Park, SW of Selma, Old Negro Cemetery, 32°18'N, 87°06'W, 14 Apr 1999, *J.B. Phipps* 7895 (UWO). **Hale Co.:** Gallion, 25 May 1892, *C. Mohr* s.n. (UNA). **Lowndes Co.:** NE of White Hall Holy Ground Battlefield Memorial Park, 32°23'N, 86°44'W, 14 Apr 2000, *J.B. Phipps* 8139 (UWO); NE of White Hall Holy Ground Battlefield Memorial Park, 32°23'N, 86°44'W, 14 Apr 2000, *J.B. Phipps* 8138 (UWO); ca. 8 mi W of Gordonville, on N side of Co. Rd. 12, edge of prairie 2 mi W of curve of Hwy 12 from N to W in section 27, section 28, just E of stream near BM 317.5, 29 May 1999, *R. Lance* s.n. (UWO); NW of Hayneville (W of Montgomery) Holy Ground Battlefield Park (U.S. Army Corps. of Engineers), 28 Apr 1996, *J.R. Allison and A. Schotz* 9118 (UWO); NW of Hayneville, Holy Ground Battlefield, 2 Apr 1997, *R. Lance* s.n. (UWO); NW of White Hall, Holy Ground Battlefield Memorial Park, 32°23'N, 86°44'W, 11 Apr 1998, *J.B. Phipps* 7692 (UWO); NW of White Hall, Holy Ground Battlefield Memorial Park, 32°23'N, 86°44'W, 10 Apr 1998, *J.B. Phipps* 7676 (UWO); NW of Hayneville (W of Montgomery) Holy Ground Battlefield Park (U.S. Army Corps. of Engineers), 1996/09, *A. Schotz* s.n. (UWO); NW of White Hall, Holy Ground Battlefield Memorial Park, 32°23'N, 86°44'W, 24 Sep 1996, *R.J. O'Kennon and R. Lance* 14453 (UWO). **Marengo Co.:** near Allenville, 14 Apr 1931, *E.J. Palmer* 38697 (MO); Co. Rd. 51, 2.5 km N of Co. Rd. 54, 32°27'N, 87°40'W, 12 Apr 1999, *J.B. Phipps* 7871 (UWO). **Montgomery Co.:** Montgomery, 23 Sep 1905, *T.G. Harbison* 10041 (NCU); N side of US 80 at Caney Cr., to the NE of Montgomery airport, ca. 50 ft NW of 8141, visible from W side of cut, 32°19'N, 86°23', 14 Apr 2000, *J.B. Phipps* 8142 (UWO); N side of US 80 at Caney Cr., to the NE of Montgomery airport, ca. 50 ft NW of 8141, visible from W side of cut, 32°19'N, 86°23'W, 14 Apr 2000, *J.B. Phipps* 8143 (UWO); E Montgomery Airport at jet of Caney Cr. and US Hwy 80, in utility right-of-way, ca. 200–250 ft E of creek, 7 Apr 1999, *R. Lance* s.n. (UWO); N side of US80 at Caney Creek, N Side of Rd., 32°19'N, 86°23'W, 12 Apr 1999, *J.B. Phipps* 7878 (UWO); no locality, 23 Sep 1905, *T.G. Harbison* 10041 (UNC); N side of US 80 at Caney Creek, 32°18'N, 86°23'W, 1 Oct 1998, *J.B. Phipps and R. Lance* 7780 (UWO); US 80 at Caney Creek, 32°19'N, 86°23'W, 24 Sep 1999, *R.J. O'Kennon and R. Lance* 14452 (UWO); Montgomery, 14 May 1900, *C.D. Beadle* 2275 (US); Montgomery, 28 Sep 1899, *no collector* (US); Montgomery, 8 Aug 1895, *C.D. Beadle* B895 (US); no locality, 14 May 1900, *C.D. Beadle* 2275 (US). **Unknown Co.:** Ranger's Station, 23 May 1925, *W.W. Ashe* s.n. (NCU).

LOUISIANA. Caldwell Parish: E of Copenhagen and La. 849 and W of Ouachita River S of Columbia, Sec. 13.T12N, R4E, 29 Jul 1987, *R.D. Thomas* 101097 (USCH, UWO); E of Copenhagen and La. 849 and W of Ouachita River S of Columbia, Sec. 13.T12N, R4E, 7 Aug 1989, *R.D. Thomas* 111868 (USCH); ca. 2 km due E of Copenhagen, 92°02'W, 32°02'N, 10 Apr 1984, *J.B. Phipps and T.C. Wells* 5366 (UWO); ca. 2 km due E of Copenhagen, 92°02'W, 32°02'N, 10 Apr 1984, *J.B. Phipps and T.C. Wells* 5369 (UWO); ca. 2 km due E of Copenhagen, 92°02'W, 32°02'N, 10

Apr 1984, *J.B. Phipps and T.C. Wells 5367* (UWO); ca. 2 km due E of Copenhagen, 92°02'W, 32°02'N, 10 Apr 1984, *J.B. Phipps and T.C. Wells 5365* (UWO); ca. 2 km due E of Copenhagen, 92°02'W, 32°02'N, 30 Oct 1985, *J.B. Phipps and P.G. Smith 5875* (UWO); E of Copenhagen and La. 849 and W of Ouachita River S of Columbia, Sec. 13, T12N, R4E, 17 Nov 1985, *R.D. Thomas and B. Liles (MD) 95070* (UWO); E of Copenhagen and La. 849 and W of Ouachita River S of Columbia, Sec. 13, T12N, R4E, 3 Aug 1982, *R.D. Thomas et al. 82032* (UWO). **Sabine Parish:** Pleasant Hill Rd./Richmond Rd., 27 Mar 1918, *R.S. Cocks 3342* (NO).

MISSISSIPPI. Chickasaw Co.: MS 41 to SE of Natchez Trace Parkway, 34°05'N, 88°52'W, 13 Apr 1998, *J.B. Phipps 7713* (UWO). **Clay Co.:** Co. Rd. 83 at trash dump, Kilgore Hills area NE of Sparta, 33°48'N, 88°56'W, 30 Sep 2000, *J.B. Phipps and R. Lance 8189* (UWO); Co. Rd. 83, 0.5 mi beyond trash dump, Kilgore Hills area NE of Sparta, 33°48'N, 88°56'W, 30 Sep 2000, *J.B. Phipps and R. Lance 8191* (UWO); Co. Rd. 83 mi after trash dump, Kilgore Hills area NE of Sparta, 33°48'N, 88°56'W, 30 Sep 2000, *J.B. Phipps and R. Lance 8192* (UWO); Kilgore Hills, on SE side of gravel Rd. 83, NE of Sparta (eastbound gravel rd. off Hwy 389 just N of Sparta), just NE of Chickasaw Co. line, S7 NW4, SW4 T15S, R3E, 88°56'W, 1 Jun 2000, *R. Lance 00-210* (UWO); along Co. Rd. 8 E Side of Rd, Ca. 3.45 mi E of Co. Rd. 389, 33°47'20"N, 88°55'45"W, 01 Sep 2001, *R. Lance 2146* (UWO); ca. 4.0 mi SSE of McCondy, just W of NE-SW gravel rd. ca. 0.5 mi SW of intersection with Hwy 47, T15s R4E, S15 SE4, 10 Jul 1985, *T.E. Smith et al. 1417* (UWO). **Jasper Co.:** ca. 5 mi S of Lake near Tanglewood, N side of Rd., 32°10'N, 89°17'W, 12 Apr 1998, *J.B. Phipps 7707* (UWO). **Newton Co.:** Black Prairie Region, 4 mi S of Lawrence, 12 Jun 1957, *G.R. Cooley and J.D. Ray, Junior 5358* (USF); prairie to S of Moffett Rd., 32°14'N, 89°17'W, 16 Apr 1999, *J.B. Phipps 7908* (UWO); E of Tanglewood and ca. 3 mi S of Ponderosa Landing Strip, 32°17'N, 89°17'W, 4 Oct 1998, *J.B. Phipps and R. Lance 7811* (UWO); small prairie on S side of Moffett Rd. (branching off Gordy Rd.), 32°15'N, 89°16'W, 25 Sep 1999, *J.B. Phipps et al. 8076* (UWO). **Monroe Co.:** Becker Bottom, date and collector missing (IBE). **Oktibbeha Co.:** Starkville, 4 Sep 1894, *Mercer 2813* (CM). near Clayton Village, just E of MS State (2nd Rd. after Wilkins Rd.), 33°28'N, 88°45'W, 15 Apr 1999, *J.B. Phipps 7905* (UWO); Clayton Village, E of MS State (2nd Rd after Wilkins Rd.), 33°28'N, 88°45'W, 5 Oct 1998, *J.B. Phipps and R. Lance 7819* (UWO). **Scott Co.:** N of Sherman Hill, Durand Oak Prairie, 31°17.5'N, 89°23'W, 13 Apr 2000, *J.B. Phipps and J. Herring 8137* (UWO); NE of Sherman Hill, just S of Durand Oak Prairie Forest Rd. 551F ca. 3.5 mi in, 31°17.5'N, 89°23'W, 13 Apr 2000, *J.B. Phipps and J. Herring 8134* (UWO); ca. 5 mi S of Lake near Tanglewood, N side of Rd., 32°17'N, 89°18'W, 12 Apr 1998, *J.B. Phipps 7702* (UWO); NW side of Sherman on FR 551F (gated) off 551, 32°17'N, 89°22'W, 25 Sep 1999, *J.B. Phipps et al. 8081* (UWO). **Smith Co.:** S of Trenton, Bienville National Forest, 3 Nov. 2005, *R. Lance 3025* (NCU).

VIRGINIA. Amherst Co.: Blue Ridge Parkway, along Otter Creek 3.3 mi from Rt. 130, 17 May 1957, *R.S. Freer 2474* (LYN).

Crataegus austromontana Beadle (number of records: 9)

ALABAMA. De Kalb Co.: Valley Head, 4 Oct 1916, *T.G. Harbison 12* (A, NCU); Valley Head, 2 May 1911, *T.G. Harbison 537* (A, CM, UWO); Valley Head, Sep 1899, *C.D. Beadle B1288* (DOV); Valley Head, 1911, *T.G. Harbison 3382* (A); Valley Head, 10 May 1900, *C.D. Beadle s.n.* (A); Valley Head, 1911, *T.G. Harbison 663* (A).

TENNESSEE. Franklin Co.: near Cowan, 12 May 1900, *no collector 42244* (A).

Crataegus harbisonii Beadle (number of records: 9)

ALABAMA. Hale Co.: Gallion, 4 Oct 1898, *C. Mohr s.n.* (ALU). **Montgomery Co.:** N side of US 80 at Caney Creek, 10 Apr 1998, *J.B. Phipps 7674* (UWO); same loc., 1 Oct 1998, *R. Lance, s.n.* (UWO); same loc., 12 Apr 1999, *J.B. Phipps 7879* (UWO).

TENNESSEE. Davidson Co.: W Nashville, 24–25 Sep 1909, *W.W. Eggleston 5153* (CM). **Obion Co.:** near Samburg, 26 Jun 1948, *A.J. Sharp, E. Clebsch, A. Clebsch, and S. Fairchild 8007* (TENN). **Shelby Co.:** N edge of Shelby Forest, 19 Aug 1947, *A.J. Sharp, E. Clebsch, and A. Clebsch 6463* (TENN); roadside, NW of Millington, 29 Jun 1948, *A.J. Sharp, S. Fairchild and E. Clebsch 8143* (TENN). **Weakley Co.:** N of Gardner, 23 Jun 1948, *S. Fairchild, E. Clebsch and A. Clebsch 7788* (TENN).

Crataegus triflora Chapm. (number of records: 133)

ALABAMA. Autauga Co.: between Jones Bluff and Ivy Creek, S of Peace and N of Alabama River, 29 May 2000, *R. Lance 2095, 2098, 2100, 2101, 2102, 2103, 2104* (UNC); Jones Bluff, 28 Apr 1996, *J. Allison 9114a, 9114b, 9116* (GA).

Blount Co.: by I-65 ca. 5 mi N of Warrior, 23 May 1979, *R. Kral 63701* (UWO). **Calhoun Co.:** near Anniston, Area 15D Quarry, Ft. McClellan, 22 Apr 1988, *R. Smith and D. Spalding 3* (UWO); Fort McClellan Military Reservation, N of Anniston, 2 Jul 1998, *R. Smith and D. Spalding s.n.* (UWO); Fort McClellan Military Reservation N of Anniston 85°46'W, 33°42'N, 2 Jul 1998, *R. Smith and D. Spalding s.n.* (UWO); near Anniston Area /SD Quarry [15] Fort McClellan 85°46'W, 33°42'N, 22 Apr 1998, *R. Smith and D. Spalding 5* (UWO); Fort McClellan Military Reservation N of Anniston 85°46'W, 33°42'N, 8 Apr 1998, *J.B. Phipps 7644* (UWO); ca. 4.8 air mi NE of Calhoun Co. Courthouse, Anniston, Fort McClellan Military Reservation, 13 Aug 1995, *J.R. Allison et al. 8917* (UWO); Fort McClellan Military Reservation

(old quarry) 33°42'N, 85°46'W, 30 Sep 1998, *J.B. Phipps and R. Lance 7774* (UWO). **Cherokee Co.:** 1 mi N of Pisgah Baptist Church Rd. on Co. Rd. 19, 7 May 1974, *T.A. Atkinson and Landers K.E. s.n.* (JSU). **Clarke Co.:** dry calcareous woods on summit of Salt Mountain, 15 May 1935, *R.M. Harper 3374* (A, GH); Jackson, 15 Apr 1852, *Dr. Henry s.n.* (ALU); Co. Rd. 15, S of Jackson, 31°26'N, 87°52'W, 1 Oct 2000, *J.B. Phipps and R. Lance 8193* (UWO). **Colbert Co.:** rocky hillside near Spring Valley, 20 Jul 1899, *H. Eggert s.n.* (A, MO). **Dallas Co.:** Pleasant Hill Rd. just before Richmond Rd., 27 Mar 1918, *R.S. Cocks 3342* (NO); Dallas Co. Rd. 407 between Shephardville and Elm Bluff near parking area on right, 32°11'N, 87°05'W, 14 Apr 1999, *J.B. Phipps 7898* (UWO); Elm Bluff area ca. 1.5 mi W of Shephardville on AL 41 32°11'N, 87°05'W, 14 Apr 1999, *J.B. Phipps 7880* (UWO); Elm Bluff area ca. 1.5 mi W of Shephardville on AL 41 32°11'N, 87°05'W, 14 Apr 1999, *J.B. Phipps 7881* (UWO). **Dallas Co.:** Rd. 407 between Shephardville and Elm Bluff near parking area on right 32°11'N, 87°05'W, 14 Apr 1999, *J.B. Phipps 7900* (UWO); Elm Bluff, W of Shephardville on Alabama River, 32°11'N, 87°05'W, 2 Oct 1998, *J.B. Phipps and R. Lance, 7790* (UWO); Elm Bluff, near Alabama River, 32°11'N, 87°06'W, 2 Oct 1998, *J.B. Phipps and R. Lance 7794* (UWO); Elm Bluff, W of Shephardville on Alabama River, 32°11'N, 87°05'W, 2 Oct 1998, *J.B. Phipps and R. Lance 7788* (UWO). **De Kalb Co.:** Valley Head, 4 Oct 1916, *T.G. Harbison 12817* (NCU); Valley Head, Alabama, 2 May 1911, *T.G. Harbison 3062* (A); Valley Head, rocky slope of Lookout Mt., 25 Apr 1924, *T.G. Harbison 5906* (A, GH); Collinsville, 26 Sep 1899, *no collector* (A); sandstone outcrop on rim of Little River Canyon, ca. 1 mi S of Co. Rd. 35 on Little River Canyon Rd., 15 Apr 1967, *R.C. Clark and K. Landers 11174* (UWO). **Etowah Co.:** on Colvin Mountain (reached by 431 to Cheeseburgh Rd.) 85°52.5'W, 33°68'N, 8 Apr 1998, *J.B. Phipps 7648* (UWO). **Franklin Co.:** State Rd. 247 at Cedar Creek Public Access Area (Cedar Creek Reservoir) 34°33'N, 87°58'W, 6 Oct 1988, *J.B. Phipps and R. Lance 7822* (UWO); AL 247 at Cedar Creek Public Access Area, 17 Apr 1999, *J.B. Phipps 7919* (UWO); W of Russellville, ca. 1/2 mi S of Co. Rd. 84, ca. 0.2 mi N of parking area for Cedar Creek Access Area, 200 ft upslope of E bank of Little Rock Creek, 10 Sep 1996, *A. Schotz s.n.* (UWO); State Rd. 247 at Cedar Creek Public Access Area (Cedar Creek Reservoir) 34°33'N, 87°58'W, 7 Oct 1998, *J.B. Phipps and R. Lance 7823* (UWO). **Greene Co.:** rich low woods, 1 mi E of Boligee, 9 May 1969, *J.L. Thomas 2058* (ALU). **Hale Co.:** Gallion, Alabama, 17 Apr 1915, *T.G. Harbison s.n.* (A); E side of AL 69, oak-hickory flatwoods ca. 3/8 mi S of Gallion, a little N of Marengo Co. line 32°29'N, 87°42'W, 12 April 1999, *J.B. Phipps 7867* (UWO); Gallion, 16 Apr 1915, *T.G. Harbison s.n.* (UNC); E side of AL 69 Oak-hickory flatwoods abt 3/8 mi S of Gallion, a little N of Marengo Co. line, 32°29'N, 87°42'W, 12 Apr 1999, *J.B. Phipps 7866* (UWO); 0.3 mi S of Railroad crossing, hwy 69 just S of Gallion Woods on E side of the road, 3 Oct 1988, *R. Lance s.n.* (UWO). **Jefferson Co.:** Gate City, near Birmingham, 28 Sep 1899, *C.D. Beadle B1397* (A, ALU, DOV, MO); near Gate City, 5 May 1900, *C.D. Beadle B2280* (ALU, MO); Red Mountain, Birmingham, 2 Oct 1916, *T.G. Harbison 4007* (A); Birmingham, 12 Sep 1911, *T.G. Harbison 674* (A); Birmingham, 10 Sep 1911, *T.G. Harbison 10674* (NCU). **Marion Co.:** Bear Creek, N of Hackleburg, 28 May 1972, *R. Kral 46812* (VDB). **Marengo Co.:** Co. Rd. 51, 2.5 km N of Co. Rd. 54 32°27'N, 87°40'W, 12 Apr 1999, *J.B. Phipps 7869* (UWO); Co. Rd. 51, 2.5 km N of Co. Rd. 54 32°27'N, 87°40'W, 12 Apr 1999, *J.B. Phipps 7868* (UWO); Allenville Rd., ca. 1.5 mi N of jct of hwy 54, on E side, 9 Apr 1999, *R. Lance s.n.* (UWO). **Montgomery Co.:** Black Belt, 19 Apr 1969, *J.C. Chitwood s.n.* (AUA); Caney Creek, SW of Montgomery, scrubby woodland N side of Hwy 80 86°23'W, 32°19'N, 6 Apr 1984, *J.B. Phipps and T.C. Wells 5312* (UWO); Caney Creek, SW of Montgomery, scrubby woodland N side of Hwy 80, 86°23'W, 32°19'N, 6 Apr 1984, *J.B. Phipps and T.C. Wells 5313* (UWO); Caney Creek, SW of Montgomery on US 80, 86°23'W, 32°19'N, 15 Oct 1984, *J.B. Phipps 5482* (UWO); US 80 at Caney Creek 32°19'N, 86°25'W, 24 Sep 1999, *R.J. O'Kennon and R. Lance 14450* (UWO); N side of US 80 at Caney Creek 32°19'N, 86°23'W, 12 Apr 1999, *J.B. Phipps 7877* (UWO); N side of US 80 at Caney Creek 32°19'N, 86°23'W, 12 Apr 1999, *J.B. Phipps 7876* (UWO); N side of US 80 at Caney Creek 32°19'N, 86°23'W, 12 Apr 1999, *J.B. Phipps 7875* (UWO); N side of US 80 at Caney Creek to the NE of Montgomery Airport 32°19'N, 86°23'W, 14 Apr 2000, *J.B. Phipps 8141* (UWO); Caney Creek, SW of Montgomery, N side of Hwy. 80, 86°23'W, 32°19'N, 6 Apr 1984, *J.B. Phipps and T.C. Wells 5314* (UWO); N side of US 80 at Caney Creek, to NE of Airport 32°19'N, 86°23'W, 10 Apr 1998, *J.B. Phipps 7673* (UWO); N side of US 80 at Caney Creek, 32°19'N, 86°23'W, 30 Sep 1998, *J.B. Phipps, and R. Lance 7775* (UWO); N side of US 80 at Caney Creek, 32°19'N, 86°23'W, 1 Oct 1998, *J.B. Phipps, and R. Lance 7779* (UWO). **Russell Co.:** roadside of Ala. 37, ca. 4 mi S of Marengo, 18 Jul 1967, *R.C. Clark 16135* (NCU). **Sumter Co.:** Fort Tombigbee, near Epes at Jones Bluff, off Hwy 11 (site owned by Univ. of W Alabama) NE of car-park 32°42'N, 88°07'W, 11 Apr 1998, *J.B. Phipps 7693* (UWO); Tombigbee, near Epes at Jones Bluff, off Hwy 11 (site owned by Univ. of W Alabama) NE of car-park 32°42'N, 88°07'W, 11 Apr 1998, *J.B. Phipps 7694* (UWO). **Winston Co.:** Ranger's Station in Winston Co., 24 May 1925, *W.W. Ashe s.n.* (NCU). **Unknown Co.:** Ranger's station on a hill, 28 May 1925, *W.W. Ashe s.n.* (NCU); near Nitrate plant, 14 May 1934, *C.J. Charlesworth and T.G. Harbison 716* (TENN).

ARKANSAS. Hot Springs Co.: De Roche Quadrangle, NW 1/4, Sec. 32, T 45, R 19 W, 18 Jul 1977, *J.L. Roberts 427* (UARK); 1.5 mi NW of De Roche off Co. Rd. 101, W of S.R. 128, 24 Apr 2006, *G. Yatskievych et al. 06-12* (MO, UWO).

GEORGIA. Bartow Co.: Pumpkinvine Creek, 9 May 1996, *J. Allison 9138* (GA); Pumpkinvine Creek, 28 Aug. 1996, *J. Allison 9431* (GA). **Dade Co.:** Fox Mountain Track up E side from S of Rising Fawn (at large run-off right)

34°44'N, 85°32'W, 19 Apr 2000, *J.B. Phipps et al. 8153a* (UWO); Fox Mountain Track up E side from S of Rising Fawn (at large run-off right) 34°44'N, 85°32'W, 19 Apr 2000, *J.B. Phipps et al. 8153* (UWO). **Floyd Co.:** cliffs along S side of Coosa River, 3mi SE of Rome, 30 Sep 1951, *W.H. Duncan 13323* (GA); cliffs of the Coosa River, 6 May 1899, *C.S. Sargent s.n.* (A, MO); cliffs of Coosa River near Rome, no date, *T.G. Harbison s.n.* (NCU); cliffs of Coosa River near Rome, 26 Jul 1899, *C.D. Beadle B764* (A); 4 mi below Rome, 6 May 1899, *no collector name C-O* (A); cliffs of Coosa River, Rome, 15 Sep 1899, *C.D. Beadle B1184* (A); cliffs of Coosa River, Rome, 20 Sep 1910, *T.G. Harbison 144* (A); cliffs of Coosa River near Rome, 5 May 1899, *W.M. Canby 43* (CM); cliffs of Coosa River near Rome, 5 May 1899, *W.M. Canby s.n.* (DOV); cliffs of Coosa River near Rome, 1899/9, *C.D. Beadle B1397* (DOV); Rome, 1882, *A.W. Chapman s.n.* (GH); McGee Bend Rd, off Ga. 100 (WSW of Rome), 19 Apr 2000, *J.B. Phipps et al. 8160* (UWO); McGee Bend Rd, off Ga. 100 (WSW of Rome), 19 Apr 2000, *J.B. Phipps et al. 8156* (UWO); above Coosa River, ca. 3 mi, SW Rome, 4 May 1980, *R. Kral 64929* (VDB). **Houston Co.:** Oaky Woods Wildlife Management Area, Green Violet Prairie, 14 Apr 2006, *J.B. Phipps and R. Lance 9064* (UWO); Oaky Woods Wildlife Management Area, Green Violet Prairie, 25 Sep 2005, *R. Lance 2930, 2931, 2932* (UWO). **Walker Co.:** poorly marked trail on Pigeon Mountain from SSW of Marsh Crossing to Bluebird Gap 34°42.5'N, 85°21'W, 18 Apr 2000, *J.B. Phipps et al. 8151* (UWO); Pigeon Mt. near summit, W side of slope at limestone outcroppings, NE of pocket Brance, N 34° 42.187', W 085° 21.998', 25 May 2000, *R. Lance 00-019* (UWO). **Unknown Co.:** mountains of Georgia, *no collector* (MO); Georgia, May 1895, *A.W. Chapman s.n.* (DOV).

LOUISIANA. Caldwell Parish: Ouachita River, ca. 1.25 mi E of Copenhagen, Sec 13, 92°97'W, 32°01'N, 20 Apr 1984, *F.M. Givens 3604* (LSU); gorges E of Copenhagen and La. 849 and W of Ouachita River Sec. B, 10 May 1983, *R.D. Thomas and B. Hess 83427* (NLU); clay pine hills along Ouachita River, 1 mi E of Copenhagen Sec. 11, 12, 13 on moist woods, 17 Mar 1973, *P. Marx and P. Jones 422* (NLU); gorges NE of Copenhagen, NE corner of Sec. 14 clay soil, mixed hardwoods forest, 20 May 1973, *R.D. Thomas, P. Marx et al. 3439 & 1042* (NLU); along ridges just W of Ouachita River and E of Copenhagen and La. 849, 20 Apr 1979, *R.D. Thomas and Botany 103 Class 6339* (NLU); hills near small creek S of dirt road and E of Copenhagen, Sec. 13, 26 Jun 1973, *R.D. Thomas, P. Marx and Bot 313 Class 35892* (NLU); gorges along Creek 1.5 mi E of Copenhagen, 8 Jun 1973, *R.D. Thomas and P. Marx 35294 & 1323* (NLU); open clay pasture NE of Copenhagen NE corner of Sec. 14, 2 Jun 1973, *P. Marx, P. Jones and D. Lawson 1193* (NLU); gorges E of Copenhagen and La. 849 and W of Ouachita River, Section 13, 3 Aug 1982, *R.D. Thomas, T. Dorris et al. 82032* (NLU); beside small creek W of Ouachita River and E of Copenhagen Sec. 13, 6 Aug 1975, *R.D. Thomas and Bot. 313 class 45887* (NLU); beside small creek W of Ouachita River and E of Copenhagen Sec. 13, 6 Aug 1975, *R.D. Thomas and Bot. 313 class 45911* (NLU); 1.5 mi E of Copenhagen, 8 Jun 1973, *R.D. Thomas and P. Marx 35294* (UWO); 1.5 mi E of Copenhagen, 8 Jun 1973, *Thomas, R.D. and P. Marx 1323* (UWO); E of Copenhagen and La. 849 S of Columbia and W of Ouachita River, sec. 13, T12 N, R4E, 4 Apr 1987, *R.D. Thomas 99232* (UWO); E of Copenhagen and La. 849 S of Columbia and W of Ouachita River, sec. 13, T12 N, R4E, 28 Mar 1987, *R.D. Thomas and Bot. 103 class 99203* (UWO).

MISSISSIPPI. Chickasaw Co.: ca. 6.5 mi SSE of Houston, Kilgore Hills, the E edge of the county just W of Clay Co. on rural rd, T15S, R3E, S12, the NE/4 of SE/4, 12 Jan 1997, *J.R. Macdonald et al. 10267* (UWO). **Clay Co.:** Kilgore Hills, ca. 5.5mi NNE Montpelier, NW4 S7, 15 Apr 1981, *S. McDaniel and R. Haynes 24955* (FSU); ca. 6.5 mi SSE of Houston, Kilgore Hills, just inside county from Chickasaw Co. on rural rd, T15S, R4E, S7 the NW/4 of the SW/4, 12 Apr 1997, *J.R. MacDonald et al. 10266* (UWO); Co. Rd. 83 at trash dump, Kilgore Hills area NE of Sparta, 33°48'N, 88°56'W, 30 Sep 2000, *J.B. Phipps, and R. Lance 8190* (UWO). **Lee Co.:** thickets, clay and limestone hills near Verona, 22 May 1931, *E.J. Palmer 39021* (MO). **Monroe Co.:** S of Amory, ESE of jct. US 45, MS 41, S of 278 at Sandhills Rd., 33°58'N, 88°34'W, 6 Oct 1998, *J.B. Phipps and R. Lance 7820* (UWO). **Newton Co.:** Eureka Church Cemetery at jct. of Gordy Rd. and Moffet Rd. 32°15'12"N, 89°15'17"W, 2 Sep 2001, *R. Lance 2147* (MO); Eureka Church Prairie jct. of Gordy Rd. and Moffet Rd. 32°15'N, 89°15'W, 25 Sep 1999, *J.B. Phipps, R.J. O'Kennon and R. Lance s.n.* (UWO); Eureka Church Prairie jct. of Gordy Rd. and Moffet Rd., 32°15'N, 89°15'W, 12 Apr 2000, *J.B. Phipps 8124* (UWO); Gordy Rd. W of MS 505, NW quadrant, N of Moffet Rd., 32°15'N, 89°16'W, 16 Apr 1999, *J.B. Phipps 7911* (UWO); Gordy Rd. W of MS 505, NW quadrant, N of Moffet Rd., 32°15'N, 89°16'W, 16 Apr 1999, *J.B. Phipps 7910* (UWO); Gordy Rd. W of MS 505, NW quadrant, N of Moffet Rd., 32°15'N, 89°16'W, 16 Apr 1999, *J.B. Phipps 7912* (UWO); intersection of Gordy Rd. and Moffett Rd. NW quadrant, 1 km W of MS 505., 32°15'N, 89°16'W, 11 Apr 1999, *J.B. Phipps 7862* (UWO); dirt rd. parallel to MS 505 and 2/3 mi W of it, opposite Nance Hill, 32°15'N, 89°16'W, 4 Oct 1998, *J.B. Phipps and R. Lance 7809* (UWO); dirt rd. parallel to MS 505 and 2/3 mi W of it, opposite Nance Hill, 32°15'N, 89°16'W, 4 Oct 1998, *J.B. Phipps and R. Lance 7808* (UWO); dirt rd. parallel to MS 505 and 2/3 mi W of it, opposite Nance Hill., 32°15'N, 89°16'W, 4 Oct 1998, *J.B. Phipps and R. Lance 7807* (UWO); dirt rd. parallel to MS 505 and 2/3 mi W of it, opposite Nance Hill., 32°15'N, 89°16'W, 4 Oct 1998, *J.B. Phipps and R. Lance 7810* (UWO). **Scott Co.:** NW side of Sherman Hill on 551F (gated) 31°17'N, 89°22'W, 25 Sep 1999, *J.B. Phipps et al. 8080* (UWO); W of Forest, S of US 80, gated Forest Rd. 537, 32°19.5'N, 89°33'W, 12 Apr 2000, *J.B. Phipps 8121* (UWO); NE side of Sherman Hill, just S of

Durand Oak Prairie, Forest Rd. 551F ca. 3.5 mi in 31°17'N, 89°23'W, 13 Apr 2000, J.B. Phipps and J. Herring 8133 (UWO); E side of Sherman Hill, edge of Forest Rd. 551F, cutover at ca. 0.5 mi in 32°17'N, 89°23'W, 13 Apr 2000, J.B. Phipps and J. Herring 8131 (UWO); NE side of Sherman Hill, just S of Durand Oak Prairie, Forest Rd. 551F, ca. 3.5 mi in, 32°17'N, 89°23'W, 13 Apr 2000, J.B. Phipps and J. Herring 8132 (UWO); E side of Sherman Hill, edge of Forest Rd. 551F, 31°17'N, 89°21'W, 13 Apr 2000, J.B. Phipps and J. Herring 8129 (UWO); E side of Sherman Hill, edge of Forest Rd. 551F, 31°17'N, 89°21'W, 13 Apr 2000, J.B. Phipps and J. Herring 8128 (UWO); E side of Sherman Hill, edge of Forest Rd. 551F, 31°17'N, 89°21'W, 13 Apr 2000, J.B. Phipps and J. Herring 8127 (UWO); W of Forest, S of US 80, gated Forest Rd. 537, 0–200 m inside barrier, 32°19.5'N, 89°33'W, 12 Apr 2000, J.B. Phipps 8120 (UWO); W of Forest, S of US 80, closed dirt Forest Rd. 537, 32°19.5'N, 89°33'W, 26 Sep 1999, J.B. Phipps 8087 (UWO); Sherman Hill ca. 6.5 mi SW of Lake, 32°17'N, 89°24'W, 4 Oct 1998, J.B. Phipps 7812 (UWO). **Tishomingo Co.:** Tishomingo City, Mississippi, 8 May 1915, T.G. Harbison s.n. (A); Tishomingo, Mississippi, 8 May 1915, T.G. Harbison 12014 (NCU). **Webster Co.:** NE of Maben, C.R. 188, 33°34'N, 88°04'W, 27 Sep 1999, J.B. Phipps, R.J. O'Kennon, and R. Lance 8105 (UWO); ca. 2.0 mi N of Maben (T20N R12E S20 SW4 NW4) T.E. Smith property, 22 Jun 1985, T.E. Smith 1396 (UWO); off MS 15 N of Maben (Oktibbeha Co.), first dirt rd. going SE, 33°33'N, 89°04'W, 4 Oct 1998, J.B. Phipps and R. Lance 7815 (UWO); off MS 15 N of Maben (Oktibbeha Co.), first dirt rd. going SE, 33°33'N, 89°04'W, 4 Oct 1998, J.B. Phipps and R. Lance 7816 (UWO); ca. 2.0 mi N of Maben (T.E. Smith property), T20N R12E, 520 SW4 NW4, 2 May 1985, T.E. Smith et al. 1260 (UWO).

NORTH CAROLINA. Macon Co.: Chapel Hill, Emilyme Gap, Sep 1912, T.G. Harbison s.n. (NCU); Cullasaja River, Aug 1912, W.W. Ashe s.n. (NCU). **Unknown Co.:** Western NC, 23 May 1901, W.W. Ashe s.n. (NCU).

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